

KEC

KOREA ELECTRONICS CO.,LTD.

**SEMICONDUCTOR
TECHNICAL DATA****KIA6281H**

BIPOLAR LINEAR INTEGRATED CIRCUIT

5.8W DUAL AUDIO POWER AMPLIFIER.
22W BTL AUDIO POWER AMPLIFIER.

The KIA6281H is dual audio power amplifier for consumer application. It is designed for high power, low distortion and low noise. It also contains various kind of protectors. It is suitable for car-audio power amplifier with high performance.

FEATURES

• High Power

 $P_{OUT(1)}=22W(Typ.)$ $(V_{CC}=14.4V, f=1kHz, THD=10\%, R_L=4\Omega, BTL)$ $P_{OUT(2)}=19W(Typ.)$ $(V_{CC}=13.2V, f=1kHz, THD=10\%, R_L=4\Omega, BTL)$ $P_{OUT(3)}=15W(Typ.)$ $(V_{CC}=13.2V, f=1kHz, THD=1\%, R_L=4\Omega, BTL)$ $P_{OUT(4)}=5.8W(Typ.)/ch$ $(V_{CC}=13.2V, f=1kHz, THD=10\%, R_L=4\Omega, DUAL).$

• Low Distortion

 $THD(1)=0.03\%(Typ.)$ $(V_{CC}=13.2V, f=1kHz, P_{OUT}=4W, G_V=40dB, R_L=4\Omega, BTL)$ $THD(2)=0.06\%(Typ.)$ $(V_{CC}=13.2V, f=1kHz, P_{OUT}=1W, G_V=52dB, R_L=4\Omega, DUAL).$

• Low Noise

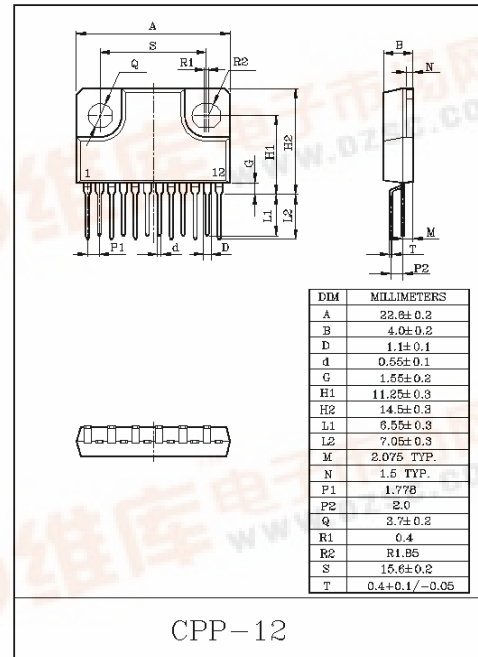
 $V_{NO(1)}=0.14mV_{rms}(Typ.)$ $(V_{CC}=13.2V, R_L=4\Omega, G_V=40dB, R_g=0, DIN\ Noise : DIN45405)$ $V_{NO(2)}=0.7mV_{rms}(Typ.)$ $(V_{CC}=13.2V, R_L=4\Omega, G_V=52dB, R_g=10k\Omega, BW=20Hz\sim 20kHz, DUAL).$

• Protector Circuit

Thermal shut down, over voltage protection

Out- V_{CC} short, Out-GND short and Out-Out short protection.

• Operating supply voltage range

 $V_{CC}=9\sim 18V.$ 

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MAXIMUM RATINGS (Ta=25℃)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Peak Supply Voltage (0.2 sec)	V _{CC} surge	45	V
DC Supply Voltage	V _{CC} DC	25	V
Operating Supply Voltage	V _{CC} opr	18	V
Output Current (Peak)	I _O (peak)	4.5	A
Power Dissipation	P _D	25	W
Operating Temperature	T _{opr}	-30~85	℃
Storage Temperature	T _{stg}	-55~150	℃

ELECTRICAL CHARACTERISTICS

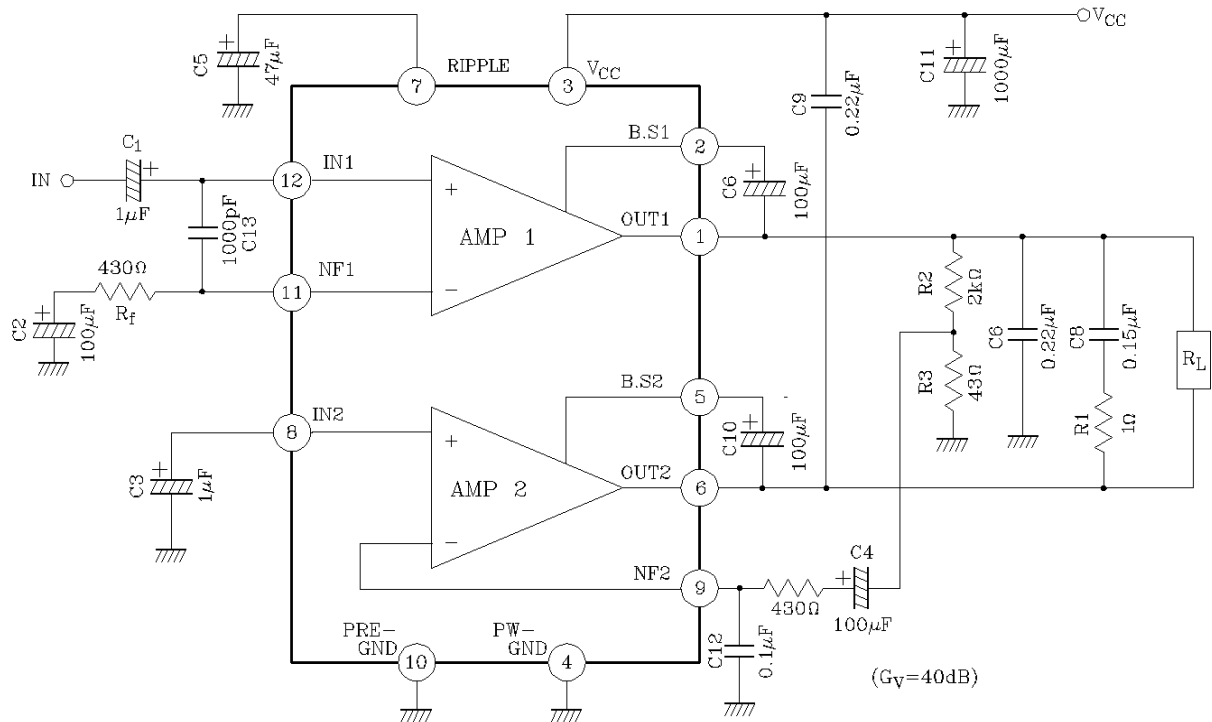
(Unless otherwise specified, V_{CC}=13.2V, R_L=4Ω, R_g=600Ω, f=1kHz, Ta=25℃)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current		I _{CCQ}	2	V _{IN} =0	-	80	145	mA
B T L M o d e	Output Power	P _{OUT} (1)	1	V _{CC} =14.4V, THD=10%	-	22	-	W
		P _{OUT} (2)	1	THD=10%	-	19	-	
		P _{OUT} (3)	1	THD=1%	-	15	-	
	Total Harmonic Distortion	THD(1)	1	P _{OUT} =4W, G _v =40dB	-	0.03	0.25	%
	Output Offset Voltage	V _{OFF}	1	V _{IN} =0	-	0	0.35	V
	Voltage Gain	G _v (1)	1	V _{OUT} =0dBm	-	40	-	dB
	Output Noise Voltage	V _{No} (1)	1	R _g =0, BW=20Hz~20kHz	-	0.14	-	mV _{rms}
	Ripple Rejection Ratio	R.R(1)	1	f _{RIP} =100Hz, V _{RIP} =0dBm	-	-52	-40	dB
D u a l M o d e	Output Power	P _{OUT} (4)	2	THD=10%	5	5.8	-	W
	Total Harmonic Distortion	THD(2)	2	P _{OUT} =1W	-	0.06	0.30	%
	Voltage Gain	G _v (2)	2	V _{OUT} =0dBm	50	52	54	dB
	Voltage Gain Ratio	ΔG _v	2	V _{OUT} =0dBm	-1	0	1	dB
	Output Noise Voltage	V _{No} (2)	2	R _g =10kΩ, BW=20Hz~20kHz	-	0.7	1.5	mV _{rms}
	Ripple Rejection Ratio	R.R(2)	2	f _{RIP} =100Hz, V _{RIP} =0dBm	-	-52	-40	dB
	Cross Talk	C.T	2	V _{OUT} =0dBm, R _g =600Ω	-	-57	-	dB
	Input Resistance	R _{IN}	2	-	-	33	-	kΩ

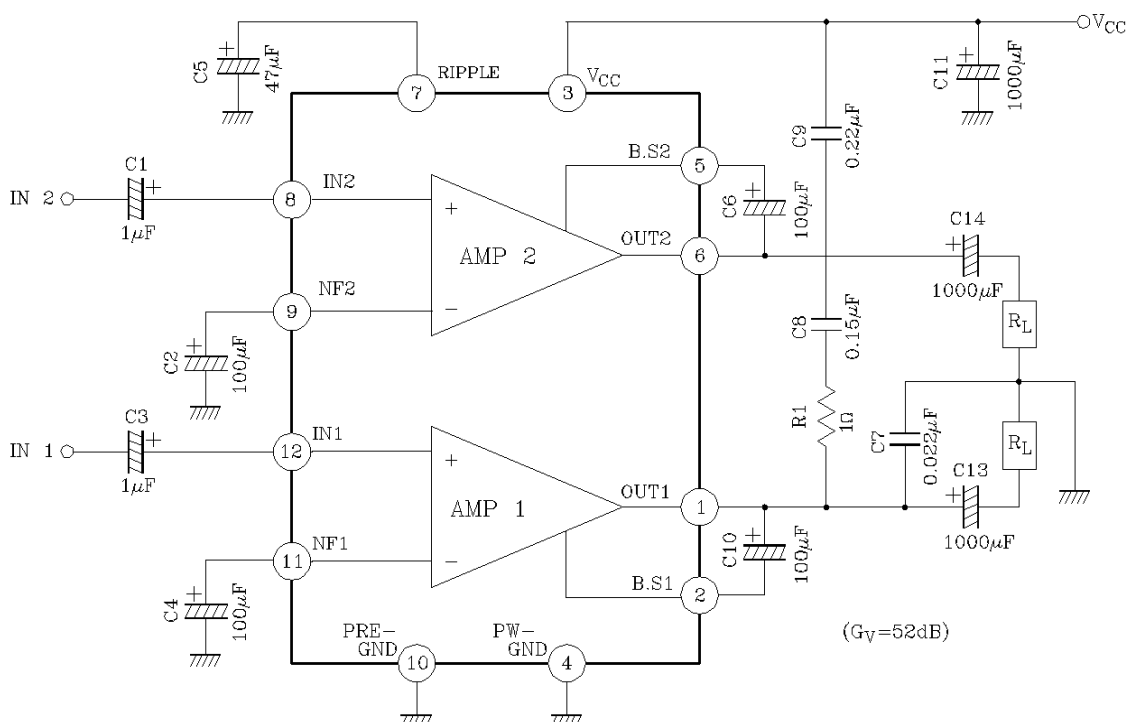
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TEST CIRCUIT / APPLICATION CIRCUIT

(1) BTL MODE



(2) DUAL MODE



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TYPICAL VOLTAGE OF EACH TERMINAL
($V_{CC}=13.2V$, $T_a=25^{\circ}C$, DUAL MODE TEST CIRCUIT)

TERMINAL NO.	1	2	3	4	5	6	7	8	9	10	11	12
DC Voltage(V)	6.4	12.3	V_{CC}	GND	12.3	6.4	6.4	1.5	1.5	GND	1.5	1.5

APPLICATION INFORMATION

1.VOLTAGE GAIN ADJUSTMENT

(1) DUAL AMPLIFIER

The voltage gain G_V is determined by R_1 , R_2 and R_f in Fig. 1.

$$G_V = 20 \log \frac{R_f + R_1 + R_2}{R_f + R_1} (\text{dB})$$

In case of $R_f=0$

The voltage gain is set as follows:

$G_V=52\text{dB}$ (Typ.)

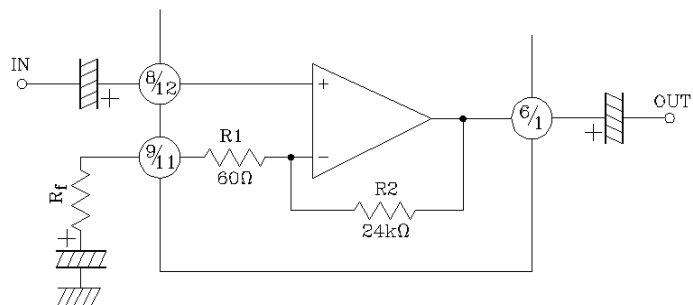


Fig. 1

(2) BTL AMPLIFIER

The recommended BTL connection amplifier shown in Fig. 2.

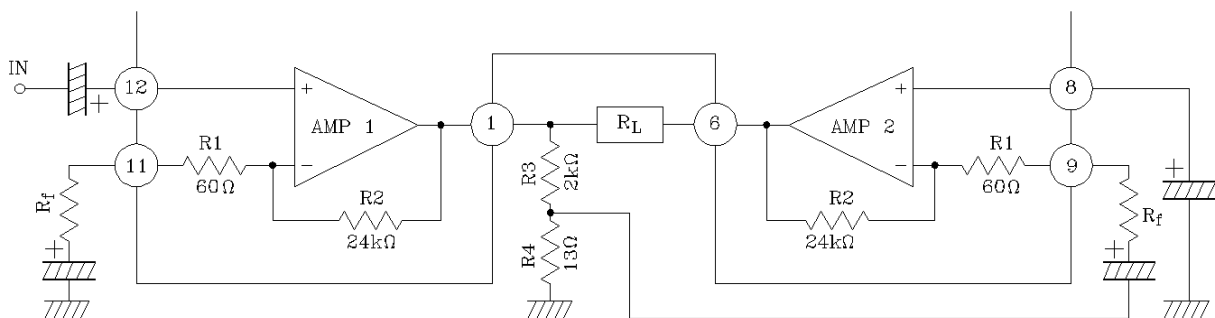


Fig. 2

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Amp. 1 is noninverting amplifier and Amp. 2 is invert one.
The output voltage is divided by resistors R_3 and R_4 .
The divided voltage is applied to inverting input of Amp. 2.
 R_3 and R_4 are determined in the following equation.

$$20 \log \frac{R_3 + R_4}{R_4} = 20 \log \frac{R_f + R_1 + R_2}{R_f + R_1} (\text{dB}) \quad G_V \text{ in Dual Mode}$$

The voltage gain in this circuit is 6dB higher than that in Dual Mode.

$$G_V = 20 \log \frac{R_f + R_1 + R_2}{R_f + R_1} + 6 (\text{dB})$$

In case of $R_f = 0$

$$G_V = 52 + 6 = 58 (\text{dB})$$

In case of $R_f = 430 \Omega$

$$G_V = 34 + 6 = 40 (\text{dB})$$

Each voltage gain can be set as shown above.

2.MUTING

Audio muting can be accomplished by connecting pin ⑦ (ripple filter) to GND as shown in Fig. 3.
Then, the bias circuits are cut off.

However, caution must be exercised to the following items.

- (1) The recovery time from the muting operation is determined by the capacities of the ripple filter capacitor between ⑦ pin and GND, and of the capacitor for NF.
- (2) As this muting system is operated by the short-circuit of ripple filter : C5, the ripple rejection ratio becomes worse in the muting condition.
At mute ON, some pop noises of breaking the bias are produced.

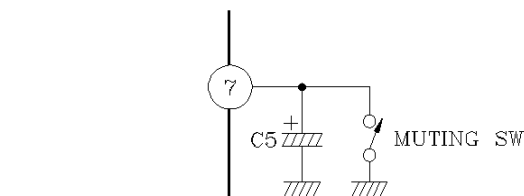


Fig. 3

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The output waveform at muting ON/OFF during BTL, are shown in fig. 4.
(Provided $V_{CC}=13.2V$, $R_L=4\Omega$, non-signal.)
50dB or more can be obtained for muting amount.

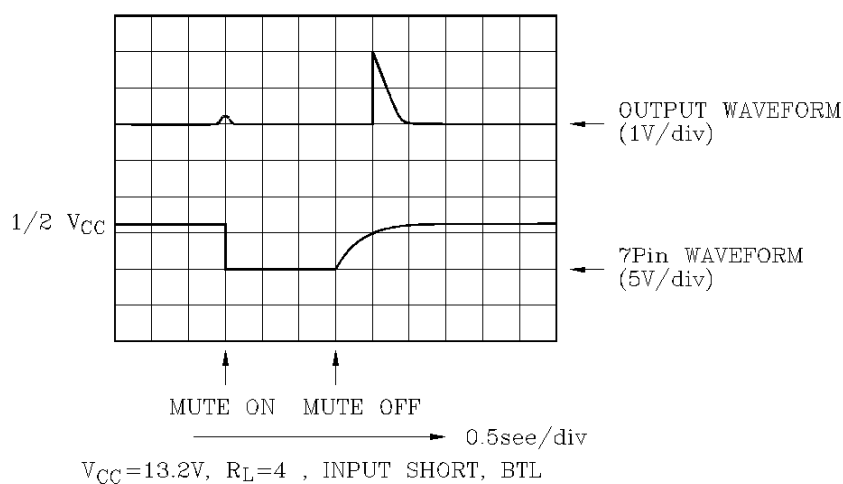


Fig. 4

3. MEASURES AGAINST OSCILLATION

C7, C8, C9, C12 : The capacitor of polyester film having small variation of the temperature characteristics is recommended as the capacitor for oscillation prevention.

C13 : Reduces the gain in the high range frequency (150kHz or over) and increases the oscillation allowance.

R1 : Increases the oscillation allowance at output crippling of the low range frequency (100Hz or less).

Since the oscillation allowance varies according to the following items, carry out the temperature test to confirm the oscillation allowance.

- (1). Gain to be used (G_V setting).
- (2). Capacity of capacitor
- (3). Kinds of capacitor
- (4). Layout of printed board

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It is recommended to use the capacitor having the capacity exceeding the oscillation stopping value.

At using with the voltage gain G_V lowered or with the high range frequency and the oscillation becomes liable to be produced.

Therefore, application with $G_V=40\text{dB}$ or over is advisable.

Especially for using with the gain lowered in DUAL operation, insert 1000pF between NF (9 pin and 11 pin) and GND.

This capacitor reduces the gain of the high range frequency and is effective for oscillation prevention.

4. OUTPUT WAVEFORM AT POWER SUPPLY ON/OFF

BTL and dual Amplifier DC output waveforms in the condition of $V_{CC}=13.2\text{V}$, $R_L=4\Omega$ at non-signal (input short) are shown in Fig. 5 and 6.

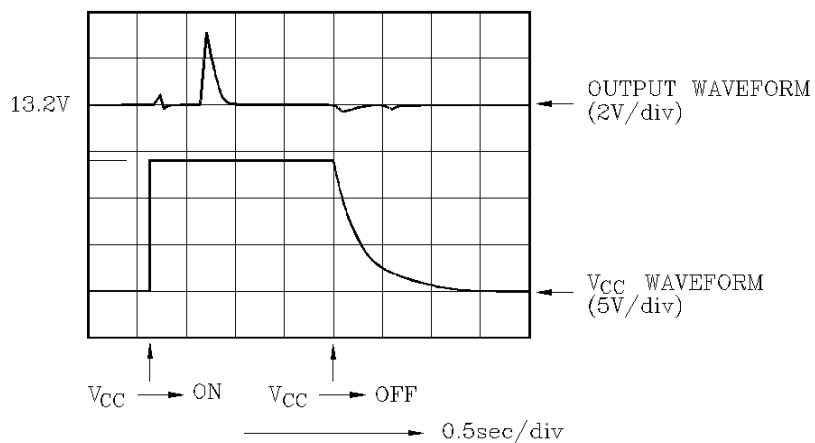


Fig. 5 BTL OPERATION

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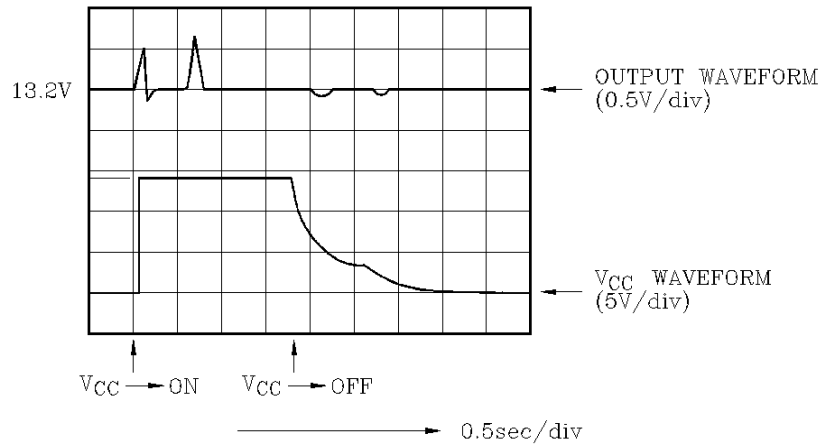
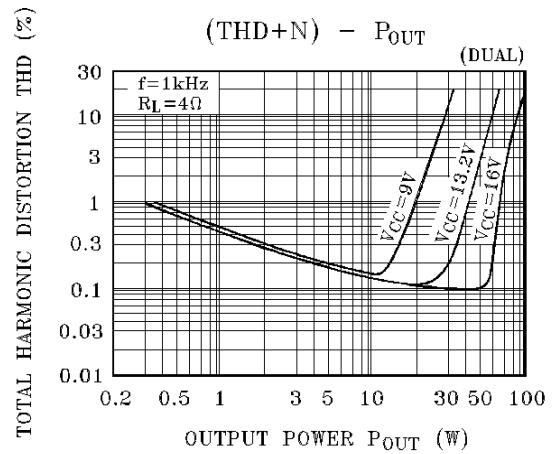
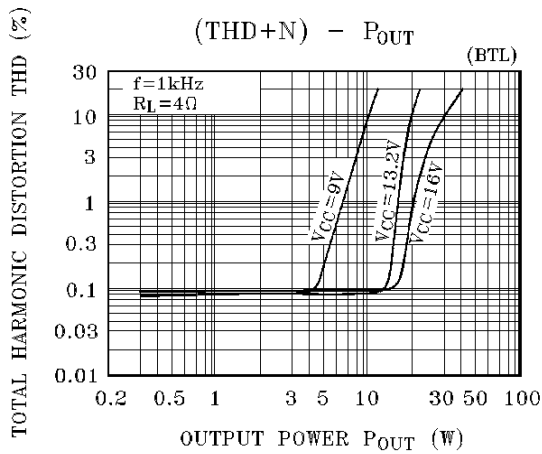
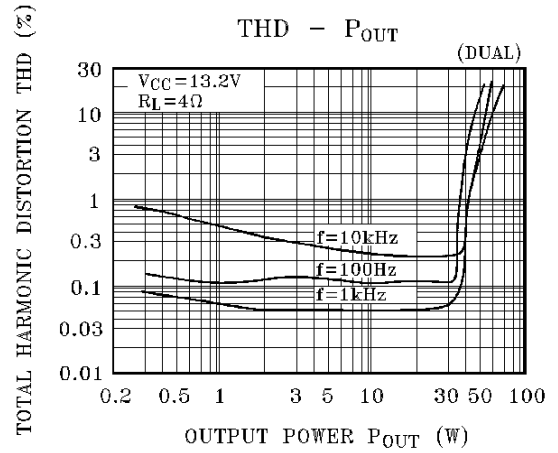
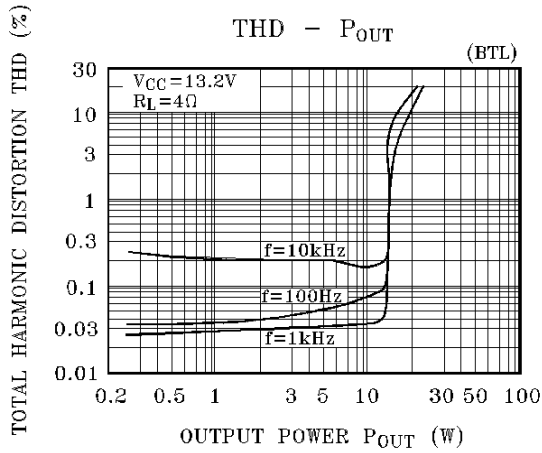


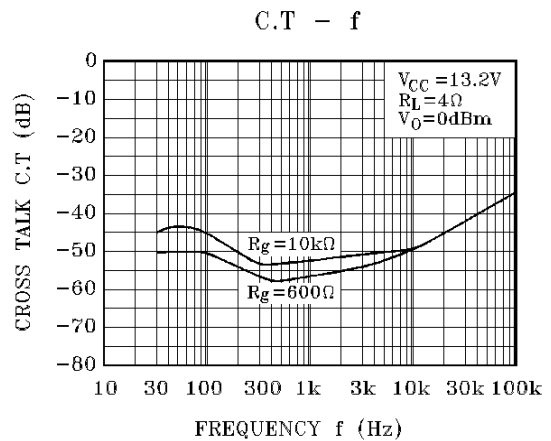
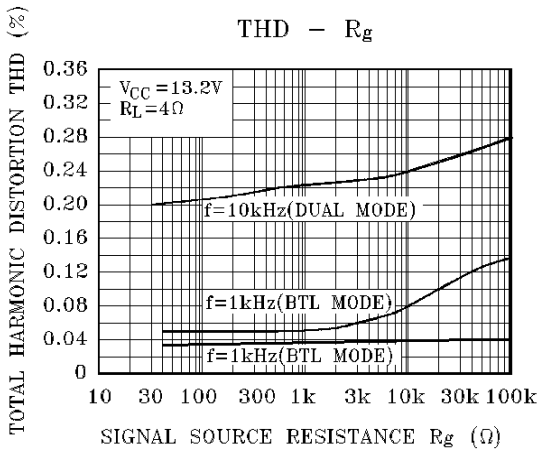
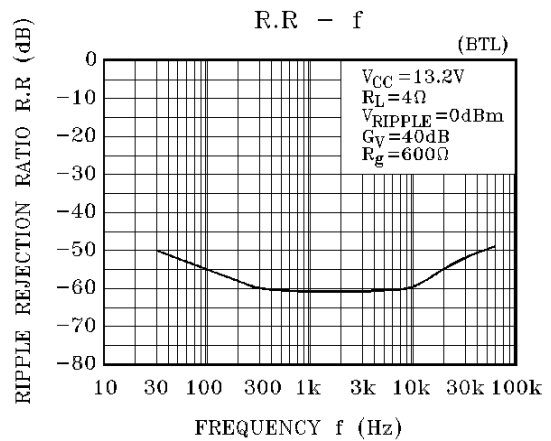
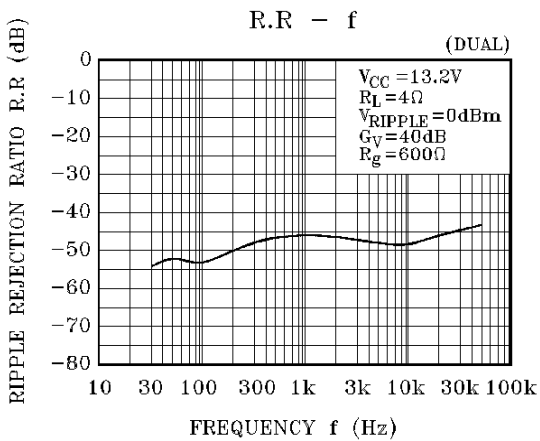
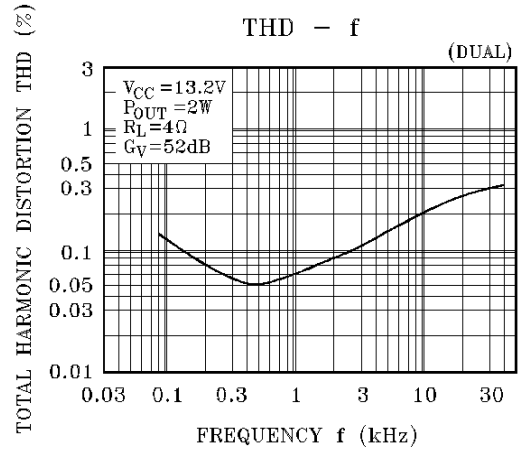
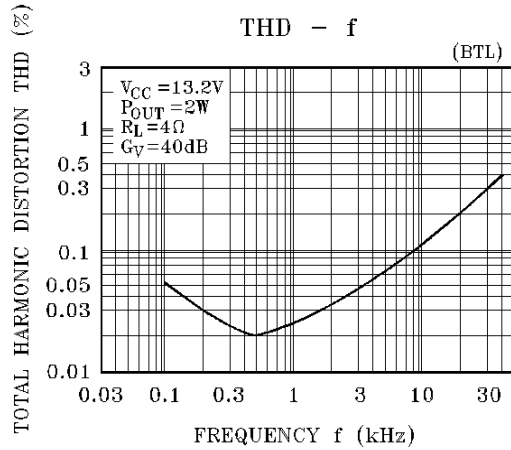
Fig. 6 DUAL OPERATION

The popping time at power supply ON/OFF varies according to the rise and fall times. The condition in which the power supply is rapidly and repeatedly made ON/OFF, that is, the condition in which the charge is made on the external capacitor of IC is different from the conditions shown in Fig. 5 and Fig. 6.

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